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A NEW SPECIES OF GLANDULOCAUDINE CHARACID FISH, *HYSTERONOTUS MYERSI*, FROM PERU

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INTRODUCTION

On August 23, 1964, one of the authors (Thomerson), Jerry Anderson, Albert J. Klee, Emanuel Ledecky-Janachek, Winfield Rayburn, and Dr. Richard L. Stone made a collection of fishes taken from a small stream tributary to the Pachitea River (Amazon drainage) at the northeastern outskirts of Tournavista, Province of Huanuco, Peru. Some of these were kept alive for experimental purposes and some were preserved. Among the fishes taken were representatives of the new species described here.

Hysteronotus is a small genus of glandulocaudine characids most recently reviewed by Böhlke (1958) who described a new species, *Hysteronotus hesperus*, amplified our knowledge of the only other known species, *Hysteronotus megalostomus* Eigenmann (1911), and redefined the genus. The characters of the new species described here and an analysis of additional specimens of *H. megalostomus* require a reevaluation of Böhlke's contribution.

Hysteronotus myersi Weitzman and Thomerson, new species.
(Figures 1, 2, 3, 4, and 5.)

Material. Holotype, a male USNM 203697, standard length 49.00 mm. (no. 13 in table 1) from a small stream directly tributary to Pachitea River (itself tributary to Ucayali River) at northeastern outskirts of Tournavista, Huanuco Province, Peru. Elevation approximately 200 meters. Paratypes, originally in two lots, one lot of 8 specimens (nos. 1–4, 7–9, and no. 14 in table 1) with same data as holotype. Second lot of 5 specimens (nos. 5, 6, and 10–12 in table 1) raised in aquaria by Thomerson and bred from specimens in lot 1 and the holotype. Disposition of these lots is as follows: specimens nos. 5, 6, 7, 11, and 14 to Academy of Natural Sciences, Philadelphia (ANSP no. 112326 for nos. 5, 6, and 11, and ANSP no. 112325 for nos. 7 and 14); nos. 1, 2, 3, 4, 8, and 9 to United States National Museum, (USNM no. 203698); nos. 10 and 12 to Tulane University Collections (TU no. 56456).

Description. Proportions as thousandths of standard length appear in table 1. Body elongate, laterally compressed, especially in males; body depth just anterior to dorsal and anal fin 2.7–3.4 times in standard length. Predorsal body profile slightly convex with slight concavity at nape; concavity deepest at posterior termination of supraoccipital spine. Along base of dorsal fin, body surface slightly arched dorsally to accommodate inclinator and other muscles of fin. Posterior to dorsal fin, body profile nearly straight with gentle downward slope to adipose fin. Posterior to adipose fin, body profile a straight level line to procurrent caudal rays in males and a slightly downward slope to these rays in females (compare figs. 1–4). Ventral profile to anus usually gently rounded with steepest inclination ventral to jaws. Ventral profile protrudes ventrally its greatest distance at point ventral to midlength of adpressed pectorals. At anal fin origin (anterior termination of fin base) body profile gently convex, more so in males, and slopes upward to beginning of caudal peduncle just posterior to posterior anal fin termination. At that point profile straight and level or sloping slightly downward to procurrent caudal fin rays. Caudal peduncle deeper in males, least depth in standard length 6.5–6.8 times in males and 7.5–8.5 times in females (compare figs. 1–4).

Length of head 3.7–4.0 times in standard length, this proportion not changing greatly in different sized specimens. Specimen 49.6 mm. (longest) and one 28.3 mm. in standard length both with head 3.9 times in standard length. Eye rather large, somewhat larger in small specimens, 2.8–3.3 times in head length. Snout short, equal to, or shorter than, eye in specimens at hand, 3.3–3.9 times in head length. Snout appears proportionally longer in small specimens (table 1). Least width bony interorbital 2.6–3.0 times in head length, always longer than snout length.

Maxillary long, relatively slender, sloping ventrally and posteriorly to form an angle of 60–80 degrees to longitudinal axis of specimens. Maxillary length

TABLE 1. *Measurements of* Hysteronotus myersi *in thousandths of standard length. Locality: small stream at northeastern outskirts of Tournavista, Huanuco Province, Peru.*

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	Range	Mean
												Holotype				
Sex	♀	♀	♀	♀	♀	♀	♀	♀	♀	♀	♀	♂	♂	♂		
Standard length (mm.)	25.3	28.1	28.3	29.0	29.8	30.9	31.5	32.4	32.6	33.8	35.5	36.5	49.0	49.6		
Greatest depth	332	292	311	331	309	334	332	336	338	322	316	372	316	349	292–372	327.14
Snout to dorsal	594	576	586	602	594	576	590	584	586	577	566	594	582	561	561–602	583.43
Snout to pectoral	268	272	289	279	272	275	298	262	267	266	271	271	268	280	262–298	274.14
Snout to pelvic	458	459	459	473	457	478	479	481	454	447	457	477	452	463	454–481	463.86
Snout to anal	601	566	597	597	571	579	590	577	586	592	597	614	582	572	566–614	587.21
Eye to dorsal	442	434	463	469	457	459	467	435	460	456	444	474	445	440	434–474	453.22
Anterior dorsal base to caudal fin base	467	463	428	467	476	472	483	466	460	458	450	482	454	475	428–483	465.07
Depth of peduncle	123	117	120	131	128	126	129	133	120	133	127	148	153	151	117–153	131.35
Length of peduncle	138	146	138	138	138	149	143	145	132	148	141	150	151	131	131–151	142.00
Length of pectoral	233	214	216	224	228	220	228	226	221	224	212	232	247	222	212–247	224.79
Length of pelvic	134	128	127	138	138	124	130	136	129	130	126	159	174	171	124–174	138.86
Height of dorsal	203	196	191	200	184	184	200	198	199	172	166	200	244	231	166–244	197.71
Length of head	268	267	258	258	258	256	266	259	248	261	251	260	253	256	248–268	258.50
Diameter of eye	095	089	088	090	087	091	082	083	089	083	079	079	076	077	076–095	085.57
Length of snout	075	068	067	066	074	074	079	071	068	071	068	074	078	076	066–079	073.50
Bony interorbit	095	089	099	097	094	094	092	093	086	089	085	088	092	093	085–099	091.86
Length of upper jaw	123	121	124	124	124	126	127	126	120	124	124	123	130	133	120–133	124.93

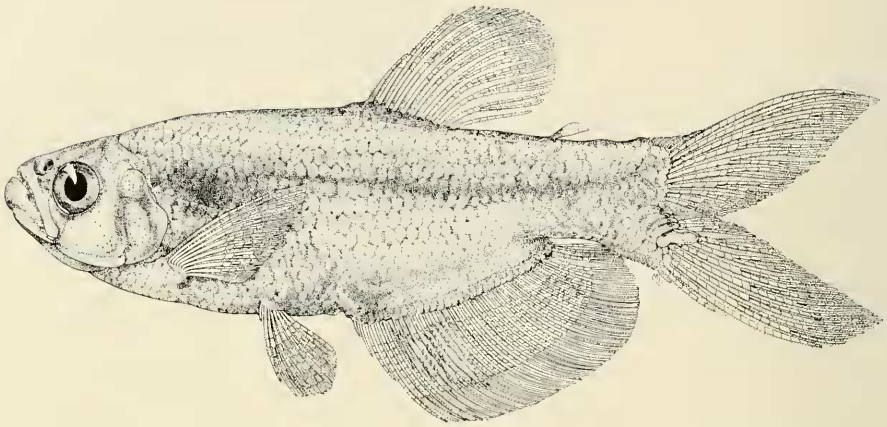

Figure 1. *Hysteronotus myersi*, new species, holotype, USNM 203697, adult male, 49.0 mm. in standard length. Small stream (tributary to Pachitea River, tributary to Ucayali River) at northeastern outskirts of Tournavista, Huanuco Province, Peru.

(measured from tip of snout to posteroventral end of maxillary) 1.9–2.2 times in head length. Teeth 7–10, tricuspid, in single row on maxillary. Four specimens with 7, three with 8, three with 9, and two with 10 teeth on one side. Teeth cover about 60–90 percent of free edge of maxillary. Premaxillary teeth in two series; outer row with 3 teeth except two specimens with 4 teeth on one side and 3 teeth on other side. Inner row with 4 tricuspid or quincuspid teeth in six specimens and 5 teeth in eight specimens. Usually 4 large, most often tricuspid, anterior teeth on each dentary (3 teeth on one side of one specimen). In large male specimens third tooth from anteromedian tooth largest and with secondary cusps reduced or absent. Sometimes other large dentary teeth with reduced cusps. Large teeth followed by 9–13 abruptly smaller and usually tricuspid teeth. No teeth on vomer, palatines, or pterygoids.

Fontanels almost absent, that part anterior to epiphyseal bar (often called frontal fontanel) not detectable, that part posterior to bar (often called parietal fontanel but almost always surrounded by frontal as well as parietal bones and supraoccipital) narrow, almost completely closed joint in all specimens. Gill rakers moderately short, pointed, longest less than ½ length of pupil, 6–8 in upper limb, 10–12 on lower limb. Two specimens with total of 16, four with 17, four with 18, three with 19, and one with 20 rakers on entire first arch of one side. Circumorbital bones well ossified, covering entire cheek area, so-called "great suborbital" (actually infraorbital 3) completely covers cheek, leaving no space between it and preopercle. Suprapreopercular process extends dorsally to level of dorsal fin of fourth infraorbital bone (postorbital of some authors). In large specimens posterior border of fourth infraorbital con-

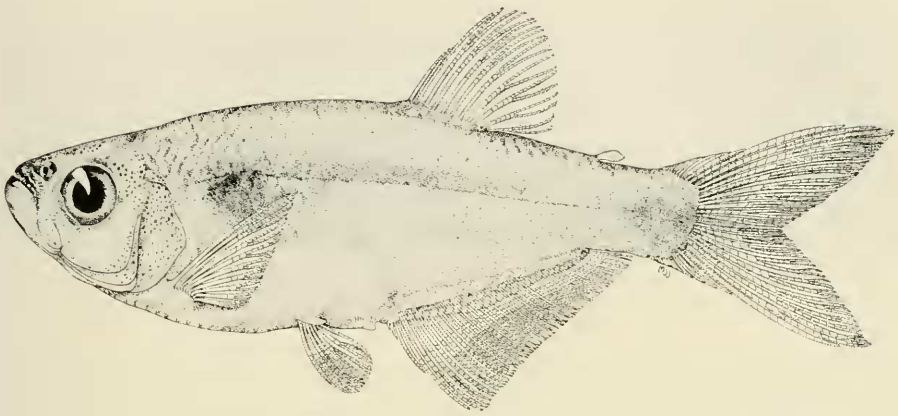

FIGURE 2. *Hysteronotus myersi,* new species, paratype, USNM 203698, adult female 32.6 mm. in standard length. Same data as holotype.

tacts suprapreopercular process. Small individuals with space between these bones. Fifth infraorbital not in contact with preopercle.

Scales of moderate size, cycloid with concentric circuli and about 8–15 grooves or radii on the exposed posterior field. Lateral line complete, perforating 39 scales in three specimens, 40 in four, 41 in three, 42 in four. Lateral line with slight ventral curve on side of body anterior to position of dorsal fin. Lateral line continues to caudal base along midline. Transverse scale rows between anterior bases of dorsal and anal fins 14–15, often 7 above and 7 below lateral line. Predorsal scale count 21–23; axillary scales present above pectoral and pelvic fins. Basal scale sheath at base of anal fin of about 27–29 scales, usually 2 obvious horizontal rows anteriorly with some accessory scales. One longitudinal scale row along posterior third of anal fin base, and 1½ rows at midregion of fin. Between bases of pelvic fin and anus, scales of both sides of body meet at midline in elongate median acute angle. Scales overlap acute midline angle only anteriorly near base of pelvic fins. No sharp keel between pelvic bases and anus. Area from anterior and posterior medial bases of pelvic fins along midventral line to isthmus, covered by scales. Ventrolateral bases of pectoral fin without greatly enlarged scales. Figure 3 diagrams scales around caudal gland at base of lower caudal fin lobe. Two lateral line scales illustrated just dorsal to posterior base of gland. Glandular tissue and fossa-like structure of gland entirely supported by modified scales, fibrous connective tissue, and skin.

Dorsal fin with ii, 9 rays in ten specimens, ii, 10 in four specimens; origin usually vertically over anterior base of anal fin, sometimes somewhat posterior to anterior anal fin base, nearer margin of opercle than base of caudal fin. Distance from tip of snout to anterior base of dorsal fin 1.7–1.8 times in

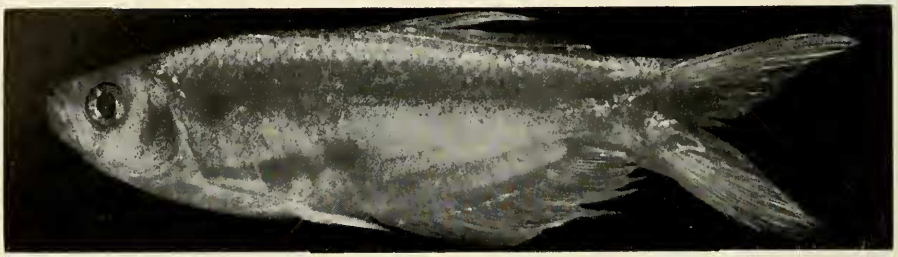

Figure 3. *Hysteronotus myersi*, new species, holotype USNM 203697.

standard length. Dorsal fin profile rounded, not "straight topped" as reported for *Hysteronotus hesperus* by Böhlke (1958). Length of longest fin ray (= height of dorsal in table 1) 4.1–6.0 times in standard length; large males with greatest dorsal fin height (4.1 and 4.2 vs. 4.9–6.0 for all other specimens) (see also table 1). Height of dorsal fin appears sexually dimorphic, but relatively short in females and small males.

Anal fin with v, 34 rays in two specimens, v, 35 in eight specimens, and v, 36 rays in four specimens. First unbranched ray not visible externally. Origin at or slightly behind midpoint of standard length. Distance from tip of snout to anal fin origin 1.6–1.8 (1.7 in eleven of fourteen specimens) times in standard length. Ventral margin of anal fin nearly straight in females, convex in males (compare figs. 1 and 2). Males with small dorsally recurved hooks on fourth through eleventh or twelfth branched anal fin rays (see fig. 1).

Pelvic fin rays i, 6 in all specimens, distal end always reaching anterior basal termination of anal fin. Length of pelvics sexually dimorphic, 5.8 times in standard length in largest males, 6.3 in smaller male and 7.4–8.1 in females. Two types of contact organs present, bony hooks and bony spinelets. Hooks of one large, thick, hooklike excresence per ray segment. Spinelets of small, slender spicules of bone, one or more per ray segment. Spinelets easily broken, hooks not easily broken. Hooks confined to anal fin. Retrorse bony spinelets on males very small, and primarily on the first and second branched ray, even in largest male; not nearly as well developed or common as on *Hysteronotus hesperus*. Two to 3 or 4 spinelets per bony segment of each fin ray.

Caudal fin with 10/9 principal caudal rays (17 branched rays) in all specimens; fin deeply forked. Males with small antrorse spinelets on dorsal edge of caudal rays, especially of lower lobe. No caudal spur.

Vertebral counts 38–39 including ural segment. Two specimens with 16 precaudals and 22 caudals, remainder (except for one abnormal specimen for which there is no count) with 16 precaudals and 23 caudals.

Color in alcohol. Humeral spot present, large, diffuse, and centered above fourth through sixth scales of lateral line. Single narrow, black, straight line extends from dorsal border of humeral spot to center of caudal peduncle

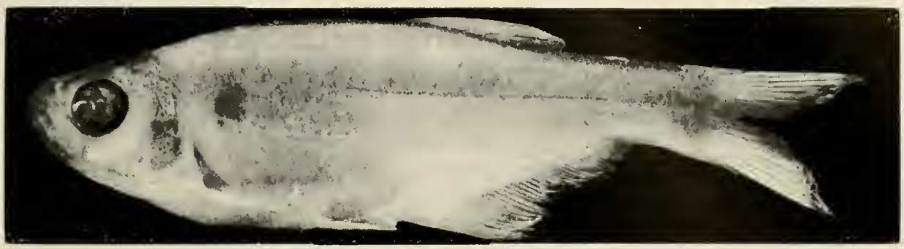

FIGURE 4. *Hysteronotus myersi,* new species, paratype ANSP 112326, adult female 30.9 mm. in standard length. Bred from specimens collected at the type locality.

where in males line arches dorsally to end at junction of center of upper caudal peduncle muscle mass with upper lobe of caudal fin (fig. 1). Line may be more diffuse than shown in fig. 1, or may be pale in some females as in fig. 2. Caudal blotch present, weak, sometimes absent as in fig. 1; weakly present in fig. 2. In male 36.5 mm. in standard length caudal blotch moderately well developed at center of union of caudal fin with caudal peduncle. Anterior border of blotch diffuse but with some dark pigment extending onto central caudal rays. Never as much pigment as in *Hysteronotus hesperus.* Compare figs. 1 through 4 with fig. 2, plate 3 in Böhlke (1958) for *H. hesperus* and fig. 4, plate 58 in Eigenmann (1927) for *H. megalostomus.* Most of body of *Hysteronotus myersi* pale brown, slightly darker dorsally and lighter ventrally. Top of head dark brown with a narrow band of dark pigment extending from head to dorsal fin base.

COLOR IN LIFE. One of us (Thomerson) has kept two pair of *H. myersi* in aquaria for several months. Their color may be summarized as follows. Females silvery with no prominent markings. Males with humeral spot and dusky stripe or band extending length of body. Both sexes with a distinct greenish iridescence. When males excited, lateral band darkens and 2 distinct pinkish spots appear at upper and lower base of caudal fin.

FURTHER AQUARIUM NOTES. Fertilization is internal. Eggs slightly oval, approximately 1 mm. in diameter, and translucent. Eggs distributed on aquarium glass, plants, and rocks. More eggs appear attached to underside of plant leaves than on top. Very few eggs deposited near bottom of tank, usually in upper ⅔ of tank (5, 15, and 20 gallon aquaria). Spawning probably occurred in early morning and eggs appear deposited individually.

SPECIES NAME. This species is named in honor of George S. Myers in recognition of his long and continued interest in characid fishes, and his frequent and helpful council to students of this complicated but fascinating group.

TYPE LOCALITY. *Hysteronotus myersi* is known only from the type locality, a small stream directly tributary to the Pachitea River (Amazon drainage) at the northeastern outskirts of Tournavista, Huanuco Province, Peru. Most

Table 2. *Measurements of* Hysteronotus hesperus *in thousandths of standard length. All specimens from eastern Ecuador. See Böhlke (1958, p. 35) for localities; compare original numbers.*

	1	2	3	4	5	6	7	8	Range	Mean
						Holotype				
Sex	♀	♀	♂	♀	♂	♂	♂	♂		
Standard length (mm.)	61.0	62.3	63.4	68.2	75.0	76.0	76.5	81.8		
Greatest depth	328	320	331	320	316	349	318	332	316–349	326.75
Snout to dorsal	640	644	640	650	657	663	612	621	612–663	640.88
Snout to pectoral	271	265	268	258	259	286	274	271	258–286	269.00
Snout to pelvic	492	475	470	469	466	470	464	454	454–492	470.00
Snout to anal	623	623	613	640	597	627	636	606	597–640	620.63
Eye to dorsal	528	518	503	532	539	542	510	514	503–542	523.88
Anterior dorsal base to caudal peduncle	386	401	427	384	376	423	402	412	384–423	401.37
Depth of peduncle	107	106	121	113	127	126	118	127	106–127	118.13
Length of peduncle	134	127	114	114	131	126	131	129	114–134	125.75
Length of pectoral	279	279	265	264	268	271	258	—	258–279	269.14
Length of pelvic	139	135	142	137	136	150	140	142	135–150	140.13
Height of dorsal	134	156	164	180	189	191	191	183	134–191	173.50
Length of head	246	229	248	232	240	268	240	252	229–268	244.37
Diameter of eye	069	069	060	066	065	072	059	061	059–072	065.13
Length of snout	067	075	077	070	076	083	081	073	067–083	075.25
Bony interorbit	090	088	087	088	084	099	089	089	084–099	089.25
Length of upper jaw	107	096	096	101	105	116	094	110	094–116	103.13
Original number	P304	Pi1001	Pi607	P308	P309	Pi1002	P306	P307		

of the specimens were taken from pools in an area of alternating shallow pools and riffles where the width of the stream varied from 1 to 5 meters and from a few centimeters to 0.5 meters deep. The bottom was gravel and sand, with a few snags and broken limbs but no macrophytic aquatic plants. The stream was in a shallow ravine and was shaded by a dense canopy of small trees, brush, and vines. Downstream were several small waterfalls leading to an area of deeper boulder filled pools. Elevation at the type locality is approximately 200 meters. A popular account of this locality is given by Klee (1965a).

Fishes were not abundant, either above or below the waterfalls. Most of the specimens of *Hysteronotus myersi* were taken from midwater in the shallow pools. Representatives of *Rivulus peruanus* Regan and loricariid catfishes were taken from the same pools, but the most abundant macroorganism was a river shrimp, *Macrobrachium brazilense* (Heller). Klee (1965b) characterized the water at the type locality as ". . . . clear, clean, cool, moving water containing little or no vegetation. It is very soft, well oxygenated, and contains little in the way of dissolved materials." These observations and the collection of the specimens of *Hysteronotus myersi* were made during the

last week of August and first week of September 1964, during the dry season.

Relationships. Böhlke (1958) reviewed in detail our knowledge of *Hysteronotus*. At that time Böhlke distinguished the two known species, *H. hesperus* and *H. megalostomus,* by contrasting 14 characters. In most of these characters, *H. myersi* appears closest to *H. megalostomus* but differs from that species in many other respects. A new comparison is made of these 14 characters plus additional characters based on new data for *H. megalostomus,* new counts and measurements of *H. hesperus* (so that all counts and measurements are consistent), and data from *H. myersi.* Tables 1, 2, and 3 present a comparison of measurements as thousandths of standard length for the three species.

Character 1, size of males: Standard length 63.4–81.8 mm. in *Hysteronotus hesperus*; 36.5–49.6 mm. in *H. myersi*; 29.0–41.8 mm. in *H. megalostomus.* All males at these various sizes appear fully adult. Both *H. megalostomus* and *H. myersi* appear to be relatively small species and the large adult males of *H. myersi* lived at least nine months in aquaria with little growth and are presumably large specimens of the species. *Hysteronotus megalostomus* may reach a larger size and perhaps these size differences between adult males of *H. myersi* and *H. megalostomus* do not reflect a real species difference. Character 2, bony hooks on anal fin of male: *H. hesperus* with true hooks on last unbranched and first 8–9 branched rays. Böhlke (1958) reported hooks extending back to third ray from posterior termination of fin; however, these are spinelets. *Hysteronotus myersi* with hooks confined to fourth through about twelfth branched rays, mostly on fifth through eleventh. *Hysteronotus megalostomus* with hooks on first through eleventh to twelfth branched rays. Character 3, pelvic fin rays: Rays i, 7 in *H. hesperus*; i, 6 in *H. myersi* and *H. megalostomus.* Character 4, humeral spot: Small, round, clearly defined in *H. hesperus*; diffuse and large in *H. myersi*; large, sharply defined, and vertically elongate in *H. megalostomus.* Character 5, outer and inner rows of premaxilliary teeth: Outer premaxillary teeth 4–6, usually 5 in *H. hesperus*; 3–4, usually 3 in *H. myersi*; and 3–5 in *H. megalostomus.* Inner premaxillary teeth 4–5, usually 4 in *H. hesperus*; 4–5, slightly more often 5, in *H. myersi*; and 5–6, usually 6 in *H. megalostomus.* Character 6, maxillary teeth: Teeth 6–9 and very strong, dorsal teeth sometimes quincuspid, ventral teeth tricuspid in *H. hesperus*; 7–10 strong, tricuspid teeth in *H. myersi*; 5–6 strong (especially dorsally in large specimens) tricuspid teeth in *H. megalostomus.* Character 7, caudal fin of males split to its base: Not split to base in male of *H. hesperus* and *H. myersi* but split to base in *H. megalostomus.* Character 8, pectoral rays: Normally i, 11 in *H. hesperus*; i, 9 in *H. myersi*; and i, 9 (12 specimens) or i, 10 (6 specimens) in *H. megalostomus.* Character 9, lower limb gill rakers: 12 or, usually, 13 in *H. hesperus*; 10–12, usually 11, in *H. myersi*; and 10–12, usually either 11 or 12, in *H. megalostomus.* Character 10, eye in head length: 3.4–4.3 times in *H. hesperus*; 2.8–3.3 in *H. myersi*; and

TABLE 3. *Measurements of* Hysteronotus megalostomus *in thousandths of standard length. Specimens 1–15 are from 3 to 4 km. northwest of Lagoa Santa, Minas Gerais, Brazil. Specimens 16–18 are from a tributary of Rio das Velhas near Lagoa Santa, Minas Gerais, Brazil.*

Sex	1 ♀	2 ♂	3 ♂	4 ♀	5 ♂	6 ♀	7 ♀	8 ♂	9 ♀	10 ♂
Standard length (mm.)	28.4	29.0	29.3	29.7	29.8	29.9	29.9	30.5	31.3	31.4
Greatest depth	274	314	324	320	329	278	291	348	294	344
Snout to dorsal	612	600	604	616	584	586	612	604	600	596
Snout to pectoral	264	268	272	262	278	251	264	256	268	268
Snout to pelvic	431	428	447	438	449	438	438	443	447	440
Snout to anal	545	507	550	515	547	522	553	535	565	522
Eye to dorsal	510	473	485	482	474	458	478	482	489	468
Anterior dorsal base to caudal fin base	382	427	406	407	413	398	415	400	400	420
Depth of peduncle	104	128	123	118	121	100	106	125	105	124
Length of peduncle	139	155	154	135	138	137	134	148	137	146
Length of pectoral	243	241	259	259	252	224	240	229	236	246
Length of pelvic	104	126	137	128	121	100	113	131	102	131
Height of dorsal	182	186	188	192	185	177	174	194	179	185
Length of head	246	231	246	246	248	244	256	239	239	242
Diameter of eye	083	076	085	084	084	080	080	082	083	086
Length of snout	076	079	082	081	084	077	080	082	083	083
Bony interorbit	090	097	097	094	098	087	097	098	096	096
Length of upper jaw	115	107	123	118	128	107	110	121	118	111
Color of pelvics			black		part black			part black		

TABLE 3. *Continued.*

Sex	11 ♂	12 ♂	13 ♀	14 ♂	15 ♂	16 ♂	17 ♂	18 ♂	Range	Mean
Standard length (mm.)	31.6	32.1	32.2	32.8	41.8	32.3	34.0	35.0		
Greatest depth	352	339	298	342	316	356	338	312	274–356	320.50
Snout to dorsal	614	592	582	598	630	597	606	600	582–630	601.83
Snout to pectoral	272	268	254	262	271	276	270	263	251–278	265.94
Snout to pelvic	446	442	432	452	440	434	456	414	414–456	439.72
Snout to anal	544	534	534	534	524	545	535	503	503–565	535.61
Eye to dorsal	478	472	475	479	505	483	462	446	446–510	477.72
Anterior dorsal base to caudal fin base	422	436	422	424	411	440	400	374	374–440	410.94
Depth of peduncle	133	122	102	125	117	124	124	111	100–133	117.33
Length of peduncle	149	157	137	137	146	149	144	140	134–157	143.44
Length of pectoral	250	—	229	232	254	251	248	223	223–259	241.41
Length of pelvic	111	131	096	137	127	127	118	108	096–137	119.50
Height of dorsal	190	181	176	183	196	179	197	177	174–197	184.50
Length of head	246	242	220	250	239	242	236	228	220–256	241.11
Diameter of eye	089	081	078	086	084	078	082	074	074–089	081.94
Length of snout	079	075	075	079	074	074	074	069	069–084	078.11
Bony interorbit	101	097	090	095	083	093	088	080	080–101	093.16
Length of upper jaw	123	115	112	116	100	118	118	114	100–128	115.22
Color of pelvics	black	black				yellow	red	black		

2.8–3.1 in *H. megalostomus*. Character 11, length of upper jaw in head length: 2.3–2.6 in *H. hesperus*; 1.9–2.2 in *H. myersi*; and 1.8–2.3 in *H. megalostomus*. Character 12, length of pelvics: 6.2–7.4 in males, 7.2–7.6 in females of *H. hesperus*; 5.8–6.3 in males, 7.3–8.1 in females of *H. myersi*; and 7.3–9.2 in males, 7.8–10.4 in females of *H. megalostomus*. Character 13, anterior dentary teeth: Quincuspid in *H. hesperus*, tricuspid in *H. myersi* and *H. megalostomus*. Character 14, fine bony spinelets of male pelvic fins: Numerous and on both sides of ray segments, usually several per segment in *H. hesperus*; not numerous, 1 or 2 per segment (sometimes up to 4 in *H. myersi*) and on one side of ray only in both *H. myersi* and *H. megalostomus*.

Other characters useful in comparing these species are as follows: Character 15, numbers of vertebrae: 40–42 vertebrae in *H. hesperus* with 17 precaudals in all specimens, 23 caudals in one specimen, 24 caudals in two specimens, and 25 caudals in five specimens; 38–39 vertebrae in *H. myersi*, with 16 precaudals in all specimens, 22 caudals in two specimens and 23 caudals in eleven specimens; 40–42 vertebrae in *H. megalostomus* with 15 precaudal vertebrae in almost all specimens and 25 caudal vertebrae in eight specimens, 26 in seven specimens, and 27 in two specimens. One specimen of *H. megalostomus* with 14 precaudal and 27 caudal vertebrae. Character 16, scales around caudal fin: *H. hesperus* with 14 (15 in one specimen) longitudinal rows of scales around caudal peduncle, *H. myersi* and *H. megalostomus* with 18. Character 17, predorsal scales: This count difficult and inaccurate but *H. hesperus* with 23–25 scales, *H. myersi* with 20–23, and *H. megalostomus* with 21–25.

Character 18, tip of snout to dorsal fin origin in thousandths of standard length (see tables 1–3): Range of *H. hesperus* (612–663), mostly beyond ranges of other two species, (561–602) for *H. myersi* and (584–614) for *H. megalostomus*. Character 19, snout to anal distance in thousandths of standard length: Ranges of *H. myersi* (566–614) and *H. megalostomus* (507–565) partly contiguous, that of *H. hesperus* (597–640) begins at upper limit of range of *H. myersi*, not approaching that of *H. megalostomus*. Character 20, eye to dorsal distance in thousandths of standard length: Range of *H. hesperus* (503–542) nearly falls outside that of other two species (434–474 for *H. myersi* and 446–510 for *H. megalostomus*). Character 21, distance between dorsal origin and base of caudal fin in thousandths of standard length: Ranges of *H. hesperus* (384–423) and *H. megalostomus* (374–440) broadly overlap; that of *H. myersi* (428-483) stands apart from that of *H. hesperus* and overlaps upper range of *H. megalostomus*. Character 22, length of caudal peduncle in thousandths of standard length: Ranges of *H. myersi* (131–151), and *H. megalostomus* (134–157) broadly overlap, while that of *H. hesperus* (114–134) barely overlaps their lower limit. Character 23, caudal gland: This gland is different in *H. myersi* and *H. megalostomus* (compare figs. 5 and 6). The

gland of *H. hesperus* is very similar to that of *H. myersi* (compare fig. 5 with fig. 6 in Böhlke 1958. Also see discussion below under Status of the Genus *Hysteronotus*). Character 24, caudal fin split to its base: The caudal fin is normally split to its base in *Pseudocorynopoma doriae* and *Hysteronotus megalostomus* but it is not split in *H. hesperus* or *H. myersi.*

The determination of the closest relative of *H. myersi* is difficult. As can be seen in the above characters, for example spinelets on the pelvic and caudal fins, number of ventral fin rays, number of outer row premaxillary teeth, number of cusps on maxillary teeth and large dentary teeth, number of pectoral rays, size of eye in relation to head length, length of the upper jaw, number of longitudinal rows of scales around caudal peduncle, proportional distance between snout tip and dorsal fin origin, proportional length of the caudal peduncle, and small scales at pectoral base, *H. myersi* more closely approaches *H. megalostomus* than it does *H. hesperus.* In a very few presumably important characters, for example caudal fin not split to its base and caudal gland structure, *H. myersi* more closely approaches *H. hesperus* than it does *H. megalostomus.*

In a few characters, for example length of pelvics in males, and relative distances between the dorsal origin and caudal fin base, *H. hesperus* and *H. megalostomus* are more similar to each other than either is to *H. myersi.* In some characters, for example in number of precaudal vertebrae, structure of glandular tissue within caudal gland, size and shape of the humeral spot, no bony hooks on first through third branched anal fin rays, relatively long pelvics in males, ventrally convex anal fin margin, and extremely rounded, convex male dorsal fin profile, *H. myersi* is unique and unlike either *H. hesperus* or *H. megalostomus.*

With our present unclear knowledge of the phyletic and genetic stability of the caudal fin organ, or gland, it is difficult to weigh the significance of this structure in showing a close relationship between *H. hesperus* and *H. myersi* in contrast to the many characters that indicate *H. myersi* is closer to *H. megalostomus.* The caudal glands of glandulocaudine characids are in need of detailed comparative study, both in their histology and gross structure. The best review of this subject to date is by Nelson (1964). See Géry (1964, fig. 4) for figures of *Glandulocauda,* and Nelson (1964, figs. 3–5) for figures of *Pseudocorynopoma, Argyropleura, Gephyrocharax, Landonia, Corynopoma,* and *Glandulocauda.* Eigenmann and Myers (1927, plates 84, 86, and 88) illustrated *Corynopoma, Landonia, Pseudocorynopoma,* and *Gephyrocharax.* Unfortunately, at present we do not know enough about either caudal glands or other characteristics of glandulocaudine characids to utilize these glands as valid, generic differences. The formation of the glandular tissue and scales in *Hysteronotus megalostomus* on the one hand, and *H. hesperus* and *H. myersi* on the other, is very different (compare figs. 5 and 6). The

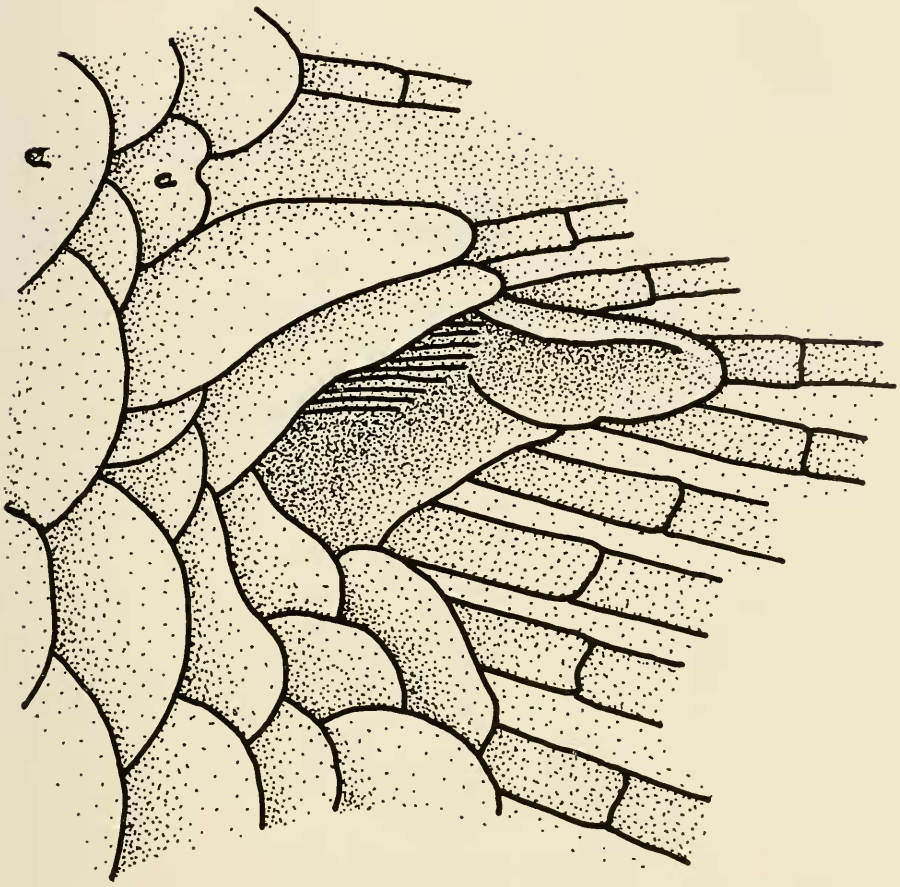

FIGURE 5. Lateral view of caudal gland of holotype of *Hysteronotus myersi.*

gland of the latter two species is surrounded in part by several modified scales and the glandular tissue lies over the lateral surface of two modified scales which curve dorsally over the glandular tissue forming a deep longitudinally oriented fossa. This fossa is open on its lateral and ventral surface. The gland of *H. megalostomus* is very different and has a very modified scale oriented ventrally around glandular material. The gland in *H. megalostomus* most closely resembles that of *Pseudocorynopoma,* see Eigenmann and Myers (1927, pl. 84, figs. 4–5). In gross dissection of *H. megalostomus* no obvious modified glandular tissue is present, but thickened skin lies over the dorsal surface of the ventral, furrowed scale, this skin being also attached medially to the fin rays. The same structure is found in *Pseudocorynopoma doriae* Perugia. The pouch of the gland in *H. megalostomus* extends anteriorly four to five scale

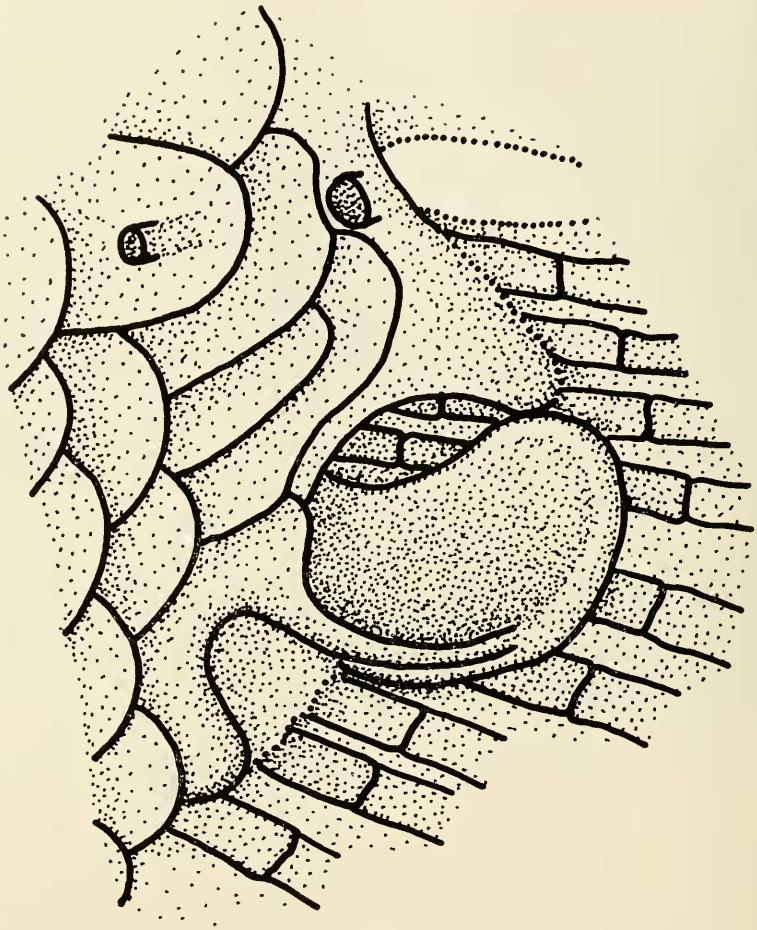

Figure 6. Lateral view of caudal gland of a specimen of *Hysteronotus megalostomus* 34.0 mm. in standard length from a tributary to Rio das Velhas near Lagoa Santa (19°39′S. longitude, 43°44′W. latitude), Minas Gerais, Brazil. This is the male with red pelvics in table 3.

rows between the scales just ventral to the lateral line and the musculature of the caudal peduncle. The external opening of the pouch is held lateral and open by the modified ventral scale and two elongate scales just anterodorsal to it. In *H. myersi* the pouch extends medially and anteriorly beneath five or six scale rows. The striated glandular tissue within the pouch turns sharply dorsally just within the pouch. This tissue ends under the area of the termination of the lateral line. In *H. hesperus* the pouch and scale structure is about the same as in *H. myersi*; however, the apparent glandular tissue in the speci-

mens at hand is not striated and only slightly thickened. It lies in the same area as the striated tissue in *H. myersi.*

Polychromatism in *Hysteronotus megalostomus.* Myers (1953) collected, preserved and labeled separately 3 males belonging to *H. megalostomus* because one had black pelvic fins, one had red, and the other yellow pelvic fins. Böhlke (1958, pp. 39–42) suggested that these 3 fishes represented 3 closely related species. He devised a key to separate them using the characters discussed below, but did not describe any of the three as a new species distinct from *H. megalostomus.* The senior author has reexamined these 3 specimens and compared them with 15 other specimens of *H. megalostomus* (table 3).

Böhlke found the body depth different in the 3 males, 3.1 for the black-finned fish, 2.9 for the red and 2.8 for the yellow. Remeasurement of these 3 specimens gives 3.1, 3.0, and 2.9 respectively, but relative differences are valid. In the additional collection of *H. megalostomus* investigated, the black-finned males have a depth of 2.8, 2.9, 3.0, 3.0, and 3.1. Two of these specimens (nos. 5 and 8 in table 3) have much less black on their pelvics than Böhlke's specimen (no. 18 in table 3). Three of the additional male specimens in table 3 have colorless (color in life unknown) pelvics and a body depth of 3.0, 3.1, and 3.2 (2.9 and 3.0 in the yellow and red specimens). These males include specimens larger and smaller than Böhlke's. Thus body depth is not a function of body length in the sizes examined. Böhlke correlated the number of pectoral rays (i, 9 in red pelvics and i, 10 in yellow pelvics) with color and believed it may be a species difference. There is no information on the red and yellow color of the pelvics in the new collection; however, of all specimens available with black pelvics, three have 9 branched rays and three have 10 branched rays; of the three colorless males, one has i, 10, two have i, 9. Böhlke found that the dorsal fin of the red-pelvic-finned male extended to the base of the adipose fin, but fell considerably short of the adipose fin in the yellow-finned male. In the additional males, the dorsal never reaches the adipose fin; however, the height of the dorsal fin varies considerably (table 3). Specimen no. 10 has a dorsal fin proportionally almost as high as specimen no. 17, the red-finned male; the dorsal of no. 10 nearly reaches the adipose fin and dorsal fin length does not separate these fishes into two groups. Böhlke reported 3 maxillary teeth in the red-finned fish and 4 and 5 maxillary teeth in the yellow-finned fish. We confirm his counts but the number of maxillary teeth is variable in several of the specimens at hand. Two specimens had 1, five had 2, four had 3, and three had 4 maxillary teeth. One specimen is damaged. Böhlke counted 31 branched anal rays in the red-finned fish and 33 rays in the yellow-finned fish. We again confirm Böhlke's counts, but in the additional specimens the branched ray counts vary from 29–33 and black-finned specimens exhibit this whole range of counts. Finally, Böhlke reported the yellow-finned fish with 43, and the red-finned specimen with 41 perforated

lateral line scales. In the specimens at hand this scale count ranges from 40–45.

All known male specimens of *H. megalostomus* have black pigment in the form of large melanophores on the body just dorsal to the pelvic fin rays; some have more of this than others. The amount of black pigment on the pelvic fins is variable and one specimen (not recorded as part black in table 3) has a few large melanophores on one pelvic fin. Perhaps the thickened fleshy interradial membranes unique to the pelvics of the yellow-finned fish studied by Böhlke are correlated with sexual activity and vary with sexual activity. In view of the above facts, we suggest that all the specimens examined, including those previously examined by Böhlke, belong to *H. megalostomus,* a single, somewhat variable, species with polychromatic pelvic fins in the males.

STATUS OF THE GENUS *HYSTERONOTUS*

Böhlke's definition of *Hysteronotus* (1958, pp. 33–34) includes the new species here described with little difficulty. In his key to the glandulocaudine genera (p. 44) Böhlke used one character of the genus, dorsal fin origin nearer the caudal base than to the eye, to separate *Hysteronotus* from four other rather unrelated genera. This statement is supported by data for *H. megalostomus* and *H. hesperus* but 12 out of 14 specimens of *H. myersi* (table 1) have the dorsal fin origin nearer the eye than the caudal base. We thus expand the definition of *Hysteronotus* to include fishes showing this character, however a revision of Böhlke's key to the glandulocaudine characid genera should be deferred until a complete and detailed review of the species involved is available.

A more questionable decision is that to include species with such diverse caudal gland structure (figs. 5 and 6) in a single genus. If caudal gland structure is strongly conservative in glandulocaudines then perhaps *H. myersi* and *H. hesperus* should be generically separated from *H. megalostomus,* a species closer to *Pseudocorynopoma* in this character. On the other hand, the three species here referred to *Hysteronotus* share a number of unique characters and the differences in caudal gland structure may have little phyletic significance. We think it best to retain *Hysteronotus* as here defined with three known species, *H. myersi, H. hesperus,* and *H. megalostomus,* until a more penetrating analysis of the phyletic significance of characters found in glandulocaudine characids can be made.

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